

Turning the Moon into a Solar Photovoltaic Paradise

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Lunar resource utilization has focused principally on the extraction of oxygen from the lunar regolith. A number of schemes have been proposed for oxygen extraction from Ilmenite and Anorthite. Serendipitously, these schemes have as their by-products (or more directly as their "waste products"), materials needed for the fabrication of thin film silicon solar cells. Thus lunar surface possesses both the elemental components needed for the fabrication of silicon solar cells and a vacuum environment that allows for vacuum deposition of thin film solar cells directly on the surface of the Moon without the need for vacuum chambers.

In support of the US space exploration initiative a new architecture for the production of thin film solar cells on directly on the lunar surface is proposed. The paper discusses experimental data on the fabrication and properties of lunar glass substrates, evaporated lunar regolith thin films (anti-reflect coatings and insulators), and preliminary attempts in the fabrication of thin film (silicon/II-VI) photovoltaic materials on lunar regolith glass substrates. A conceptual design for a solar powered robotic rover capable of fabricating solar cells directly on the lunar surface is provided. Technical challenges in the development of such a facility and strategies to alleviate perceived difficulties are discussed.

Figure Caption: Artist view of a mobile solar cell manufacture facility fabricating solar cells on the moon

